

Claims

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1. A field effect electronic device, comprising:
a field plate disposed over a dielectric layer;
a semiconductor layer disposed beneath the dielectric layer;
a drift region in the semiconductor layer, the drift region having a doping level
10 that varies substantially non-linearly across the drift region, and the device
exhibits a substantially constant reduced surface electric field.

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2. A field effect device as recited in claim 1, wherein the semiconductor layer of
the drift region has a thickness that varies non-uniformly across a width of the
drift region.

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3. A field effect device as recited in claim 2, wherein the sum of the thicknesses
of the dielectric layer over the semiconductor layer of the drift region and the
semiconductor layer of the drift region is a constant.

4. A field effect device as recited in claim 2, wherein the dielectric layer has a
thickness that varies non-uniformly across the width of the drift region.

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5. A field effect device as recited in claim 1, wherein the semiconductor is one of
silicon, silicon-germanium, or gallium nitride.

6. A field effect device as recited in claim 5, wherein the thickness of the
semiconductor layer varies exponentially across the length of the drift region.

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7. A field effect device as recited in claim 6, wherein the sum of the thickness of
the dielectric layer over the semiconductor layer of the drift region and the
semiconductor layer of the drift region is a constant.

8. A field effect device as recited in claim 1, wherein the dielectric layer is a low-k material.

5 9. A field effect device as recited in claim 8, where the dielectric layer consists essentially of BCB, and SILK.

10. A field effect electronic device, comprising:
a field plate disposed over a dielectric layer;
a semiconductor layer disposed beneath the dielectric layer;
10 a drift region in the semiconductor layer, the drift region having a doping level that varies substantially non-linearly across the drift region, and the device has a breakdown voltage of at least 700V and a relatively low specific on-resistance.

15 11. A field effect device as recited in claim 10, wherein the on-resistance is approximately $2.4 \Omega \text{ mm}^2$.

12. A field effect device as recited in claim 10, wherein the semiconductor layer of the drift region has a thickness that varies non-uniformly across a width of the drift region.

20 13. A field effect device as recited in claim 12, wherein the sum of the thickness of the dielectric layer over the semiconductor layer of the drift region and the semiconductor layer of the drift region is a constant.

25 14. 4. A field effect device as recited in claim 2, wherein the dielectric layer has a thickness that varies non-uniformly across the width of the drift region.

15. A field effect device as recited in claim 10, wherein the semiconductor is one of silicon, silicon-germanium, or gallium nitride.

30 16. A field effect device as recited in claim 15, wherein the thickness of the semiconductor layer varies exponentially across the length of the drift region.

17. A field effect device as recited in claim 16, wherein the sum of the thicknesses of the dielectric layer over the semiconductor layer of the drift region and the semiconductor layer of the drift region is a constant.

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18. A field effect device as recited in claim 10, wherein the dielectric layer is a low-k material.

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19. A field effect device as recited in claim 18, where the dielectric layer consists essentially of BCB, and SILK.

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20. A method of fabricating a field effect device, the method comprising:
forming a semiconductor layer having a non-uniform thickness across a length of a drift region of the device; and
non-uniformly doping the drift region of a semiconductor layer of the device.